Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2023

Physics

Unit 2

Foundation Tier

MV18

[GPY21]

FRIDAY 16 JUNE, MORNING

Time

1 hour 15 minutes, plus your additional time allowance.

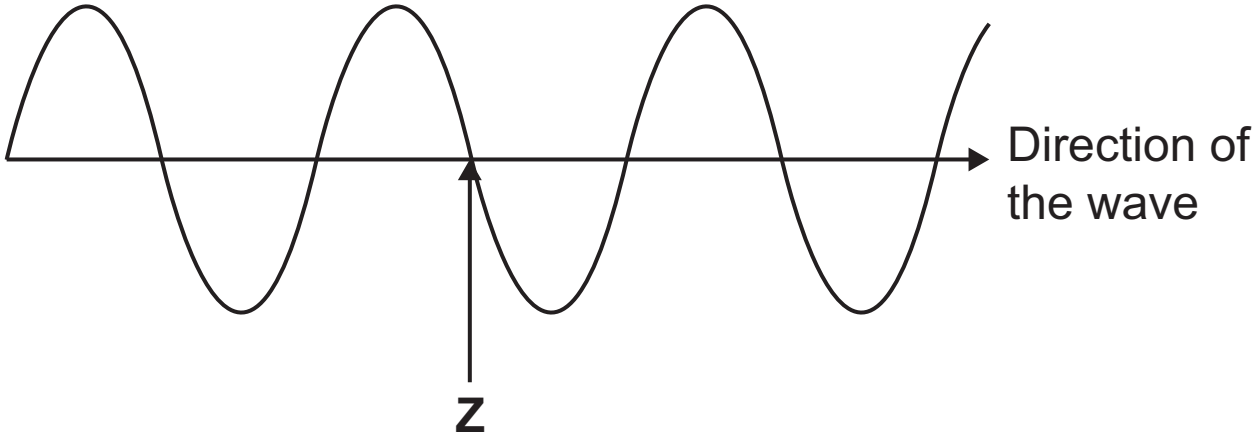
Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write on blank pages.
Complete in black ink only.
Answer **all five** questions.

Information for Candidates

The total mark for this paper is 80.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **4(b)**.

1 (a) The diagram below shows a transverse wave on a string.



(i) In what direction do the parts of the string move as the wave passes? [1 mark]

_____

(ii) On the diagram, mark clearly with arrows and labels the following: [2 marks]

the wavelength of the wave;

the amplitude of the wave.

(iii) Apart from waves on a string, name two other transverse waves. [2 marks]

1. _____

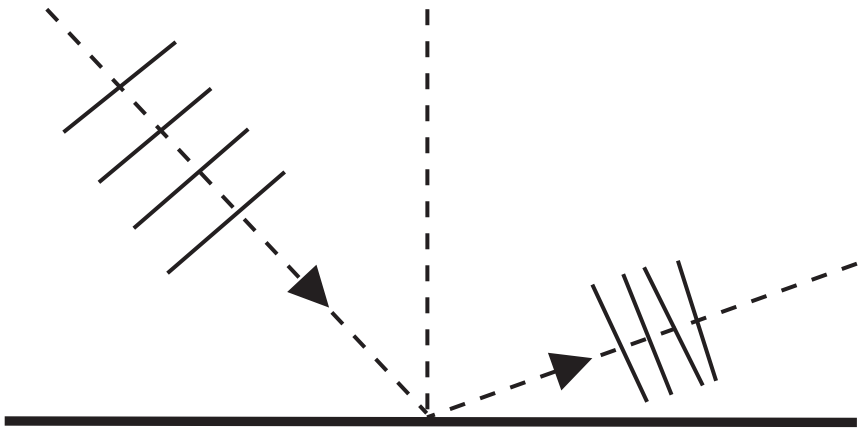
2. _____

(iv) 24 waves pass the point **Z** in 8 seconds.
Calculate the frequency of the wave. [3 marks]
Include the unit of frequency with your answer.

Frequency = _____

Unit = _____

(b) A student observes water waves being reflected by a solid barrier.
He drew the diagram shown below.
He made some mistakes.



solid barrier

Describe three of the mistakes. [3 marks]

1. _____

_____

2. _____

_____

3. _____

_____

(c) Three regions of the electromagnetic spectrum are shown below.

gamma rays			visible light			radio

(i) Write the names of the missing four regions in the appropriate boxes. [4 marks]

(ii) What property of the waves is **increasing** in the direction of the arrow? [1 mark]

_____

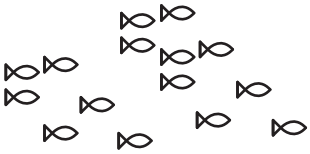
(iii) Which electromagnetic wave is detected as heat? [1 mark]

_____

(iv) Name a harmful effect of **intense** visible light. [1 mark]

_____

(d) Describe how sonar is used to detect fish. [2 marks]



Fish

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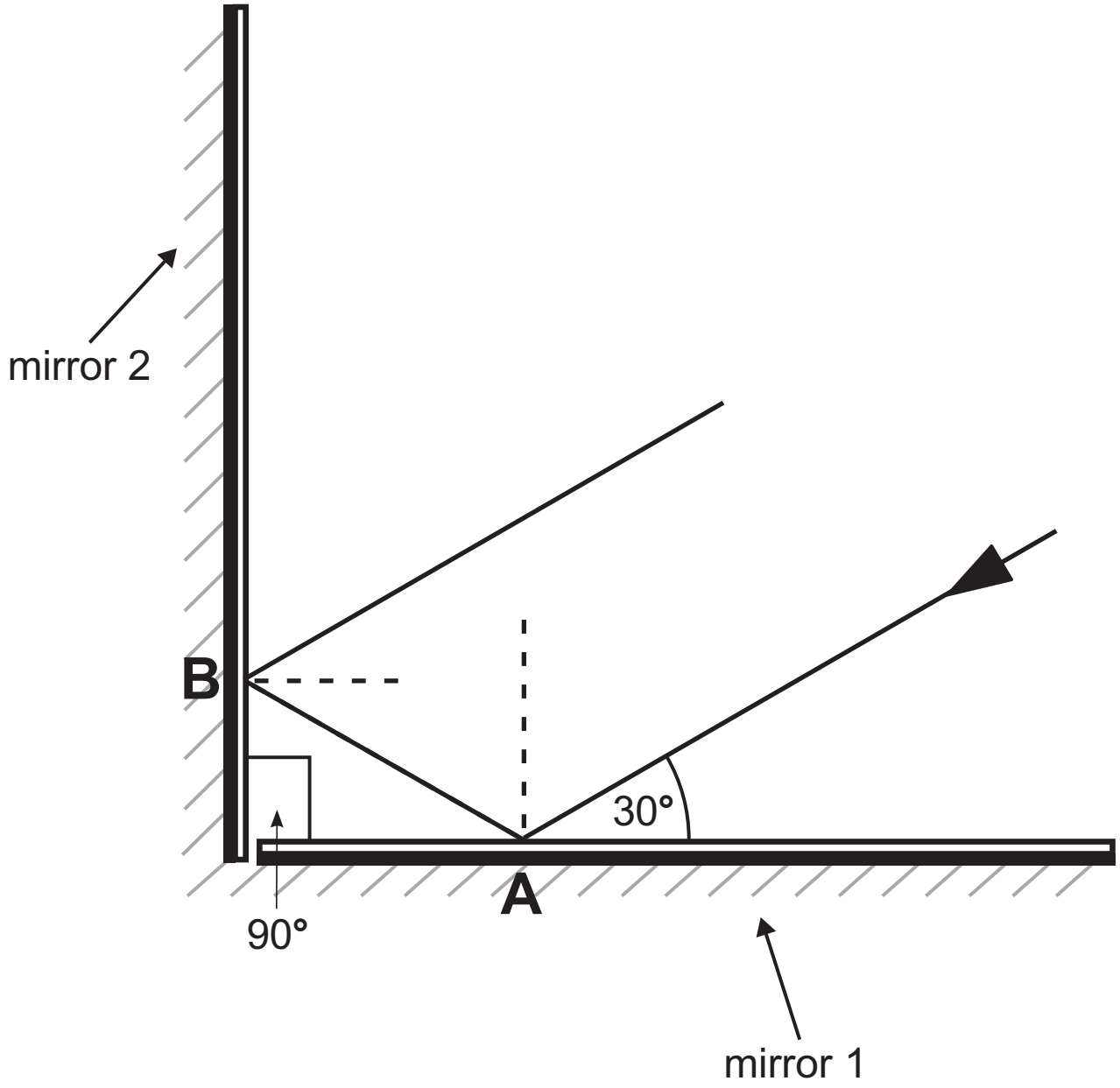
(Questions continue overleaf)

2 **(a)** The diagram shows a ray of light incident on plane mirror 1.
Plane mirror 2 is placed at right angles to this first mirror.
The ray of light is reflected from mirror 1 and then reflected from mirror 2.



(i) On the diagram, mark with the letter **i** the angle of incidence for the ray of light at point **A**. [1 mark]

(ii) What is the value of this angle of incidence?
[1 mark]

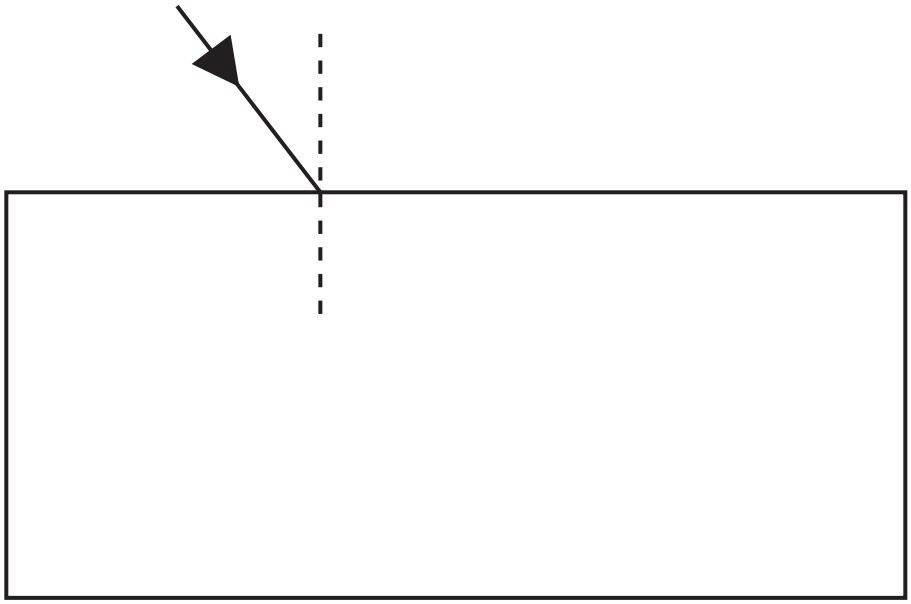
_____

(iii) On the diagram, mark with the letter **r** the angle of reflection for the ray of light at point **B**. [1 mark]

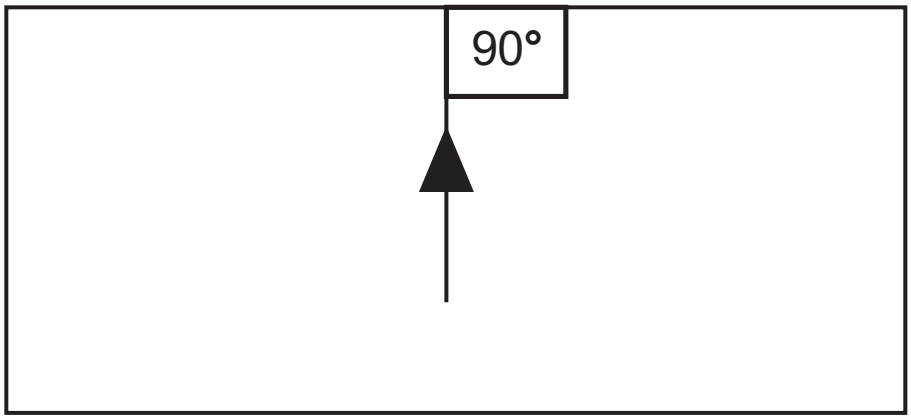
(iv) What is the value of this angle of reflection?
[1 mark]

_____

(b) (i) The diagram below shows a ray of light entering a glass block.
Complete the path of the ray through the glass block. [1 mark]

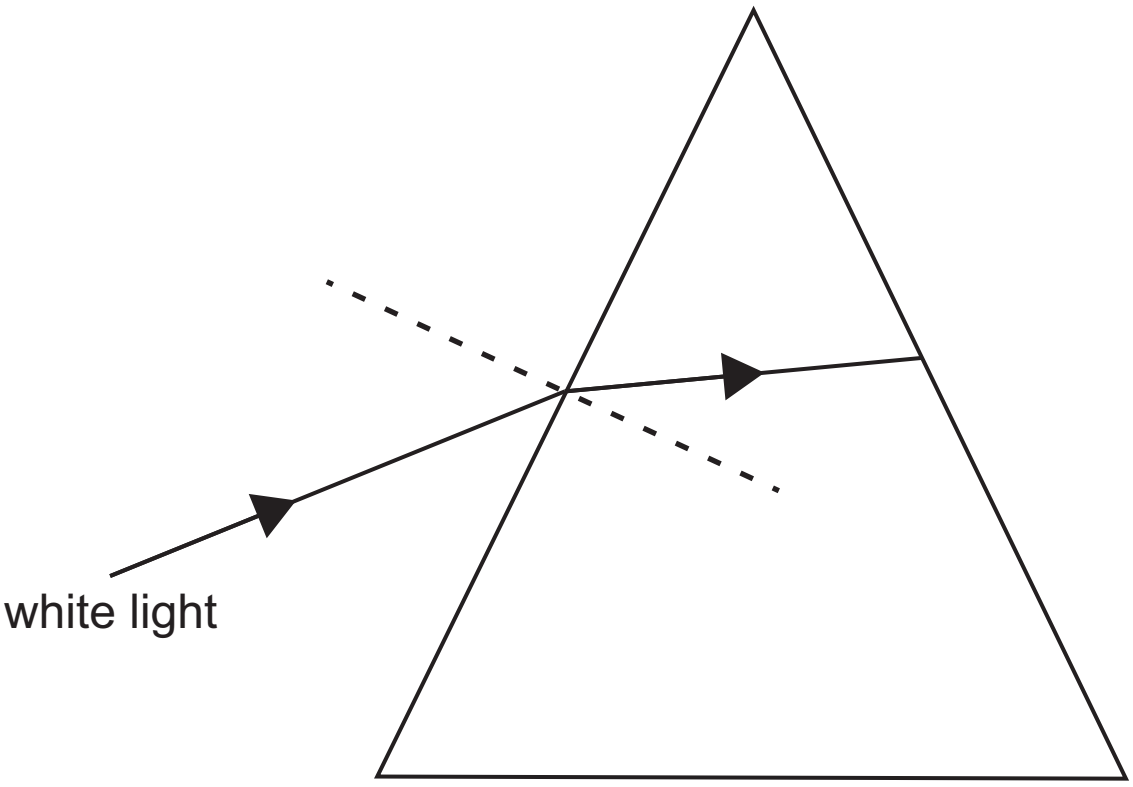


(ii) The diagram below shows a ray of light emerging from a glass block.
Complete the path of the ray as it leaves the glass block. [1 mark]



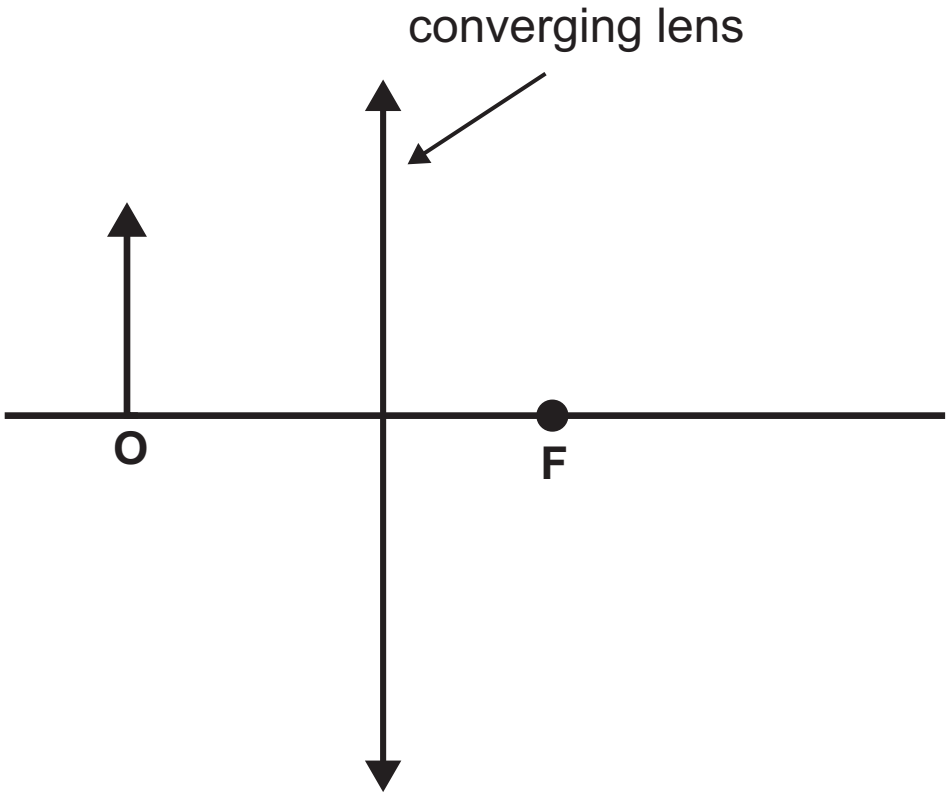
(c) When white light passes through a glass prism it is split into its component colours. This is known as dispersion.

(i) The diagram below shows the path taken by the red light inside the prism.
Complete the diagram below to show the path taken by the red light out of the prism.
Show the path taken by the violet light through and out of the prism.
Label each colour. [3 marks]



(ii) Explain fully why different colours are refracted by different amounts when they enter the glass prism. [2 marks]

(d) Complete the ray diagram below to show how the converging lens forms an image of the object O that is both magnified and real.
Label the image I.
Place arrows on the rays to show their direction.
[4 marks]



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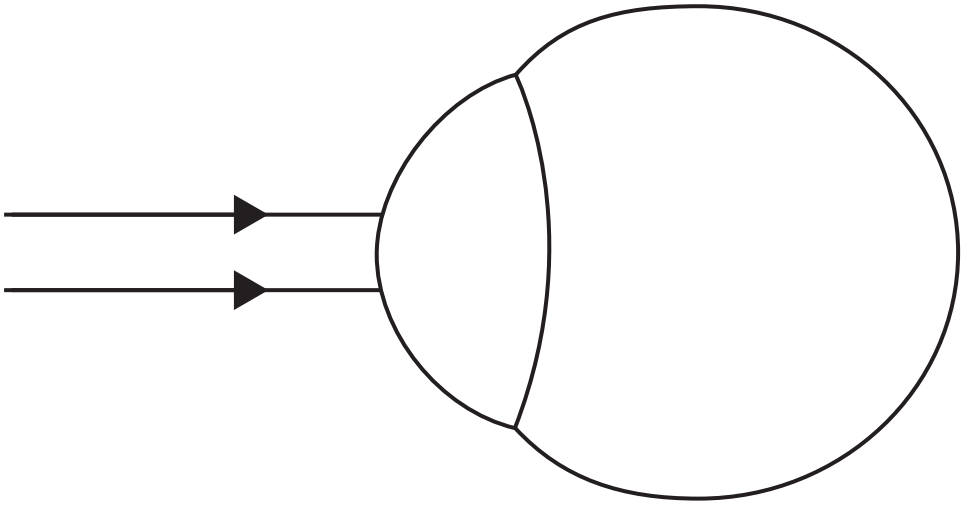
(Questions continue overleaf)

(e) (i) A person who is short-sighted is unable to see distant objects sharply.
Complete the diagram below to show how two parallel rays of light from a distant object pass through the person's eye and reach the retina. [1 mark]

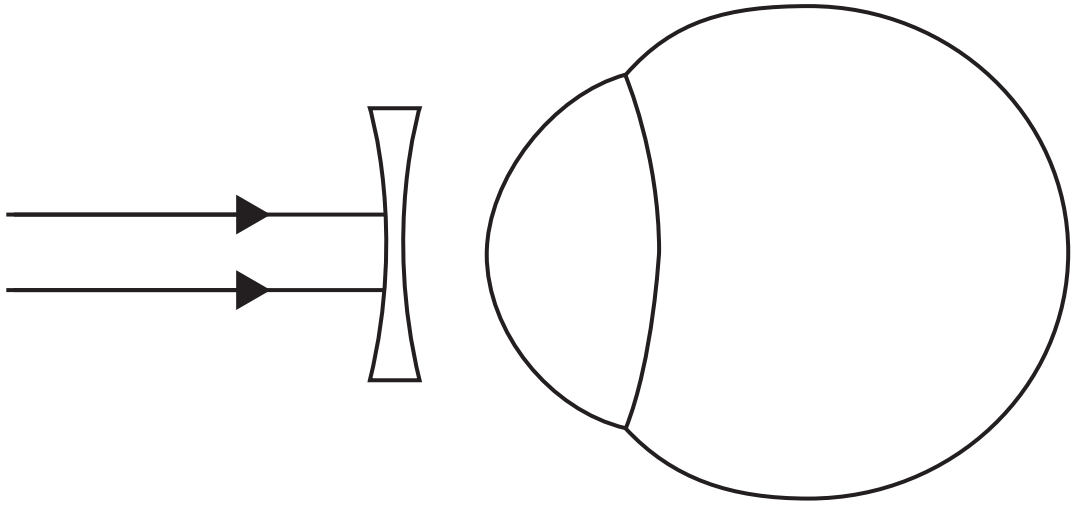


(ii) This problem is corrected by using a lens as shown in the diagram opposite.

Name the type of lens used. [1 mark]

_____

(iii) Complete the diagram below to show how two parallel rays of light from a distant object pass through the lens, through the person's eye and reach the retina. [3 marks]

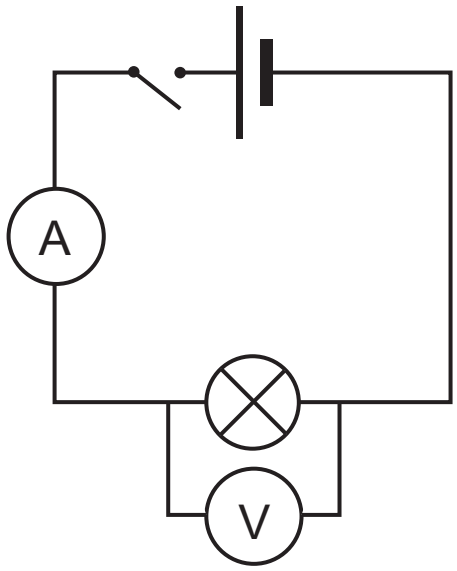


3 **(a)** Explain why electrical conductors allow a current to flow through them but insulators do not. [1 mark]

_____

_____

(b) The circuit below was set up.



When the switch is closed the ammeter reads 0.2A and the voltmeter reads 4.0V.

(i) Calculate the resistance of the lamp. [3 marks]
Show clearly how you get your answer, starting with the equation you plan to use.

Resistance = _____ Ω

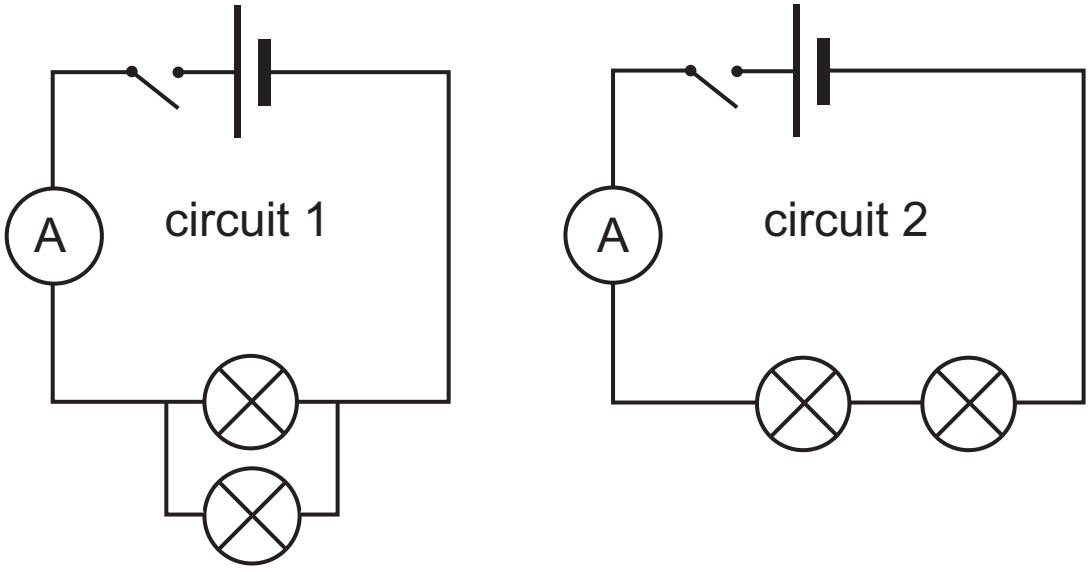
(ii) Calculate the power developed by the lamp.
[3 marks]
Show clearly how you get your answer, starting with the equation you plan to use.

Power = _____ W

(iii) The cell has an internal energy store of 5400 J.
Calculate how long the lamp will remain lit.
[4 marks]
Give your answer in **minutes**.
Show clearly how you get your answer, starting with the equation you plan to use.

Time = _____ minutes

(c) Students were asked to design a circuit which included two identical lamps and a cell.
They produced two possible circuit diagrams, **1** and **2**, as shown below.



Each of the lamps has a resistance of 10 Ω.

(i) Calculate the resistance of circuit **1**. [2 marks]
Show clearly how you get your answer.

Resistance of circuit **1** = _____ Ω

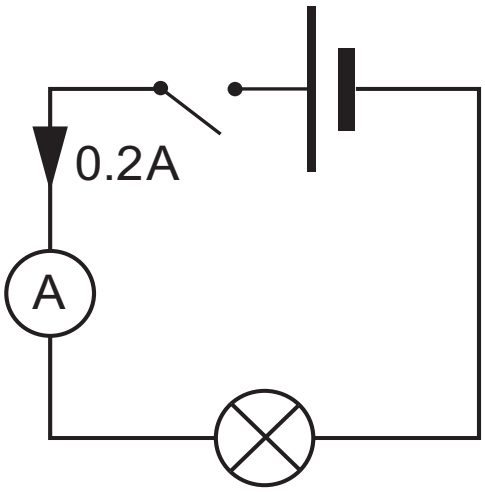
(ii) Calculate the resistance of circuit **2**. [2 marks]
Show clearly how you get your answer.

Resistance of circuit **2** = _____ Ω

(iii) In which circuit, **1** or **2**, would the lamps be brighter? [1 mark]

Circuit _____

(iv) When only one lamp is lit a current of 0.2A flows from the cell.



Determine the current flowing from the cell in each of the circuits 1 and 2. [2 marks]

Current in circuit **1** = _____ A

Current in circuit **2** = _____ A

(v) Lamps emit light when the filament becomes very hot.
In terms of particles, explain why heat is produced when an electric current flows in the metal filament. [2 marks]

_____

_____

4 **(a)** Electric current can either be a.c. or d.c.

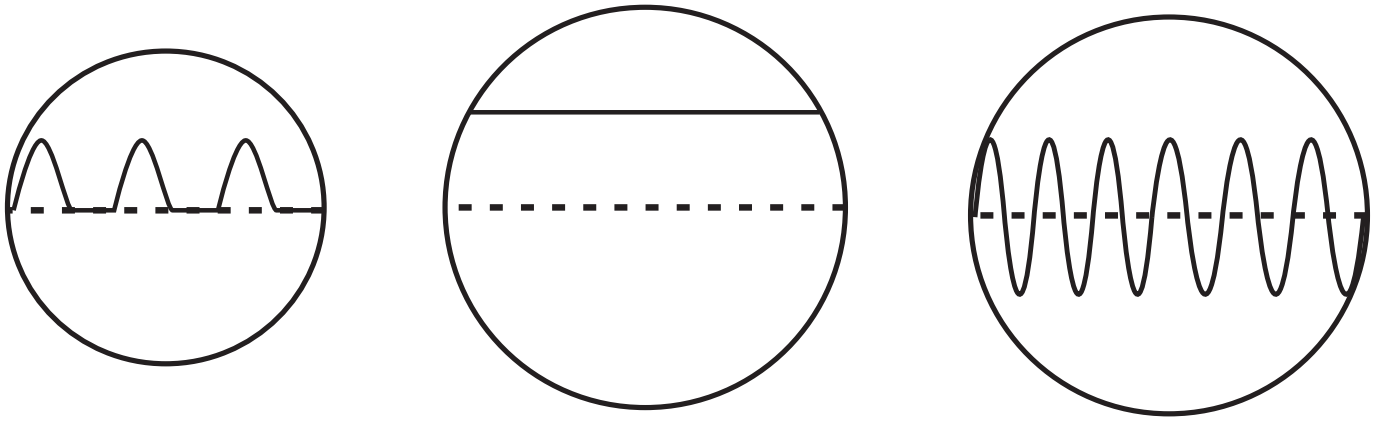
(i) State one source of a.c. _____

(ii) State one source of d.c. _____
[2 marks]

(iii) Describe how a.c. is different from d.c. [1 mark]

_____

Below are three cathode ray oscilloscope (CRO) traces of an electrical signal.

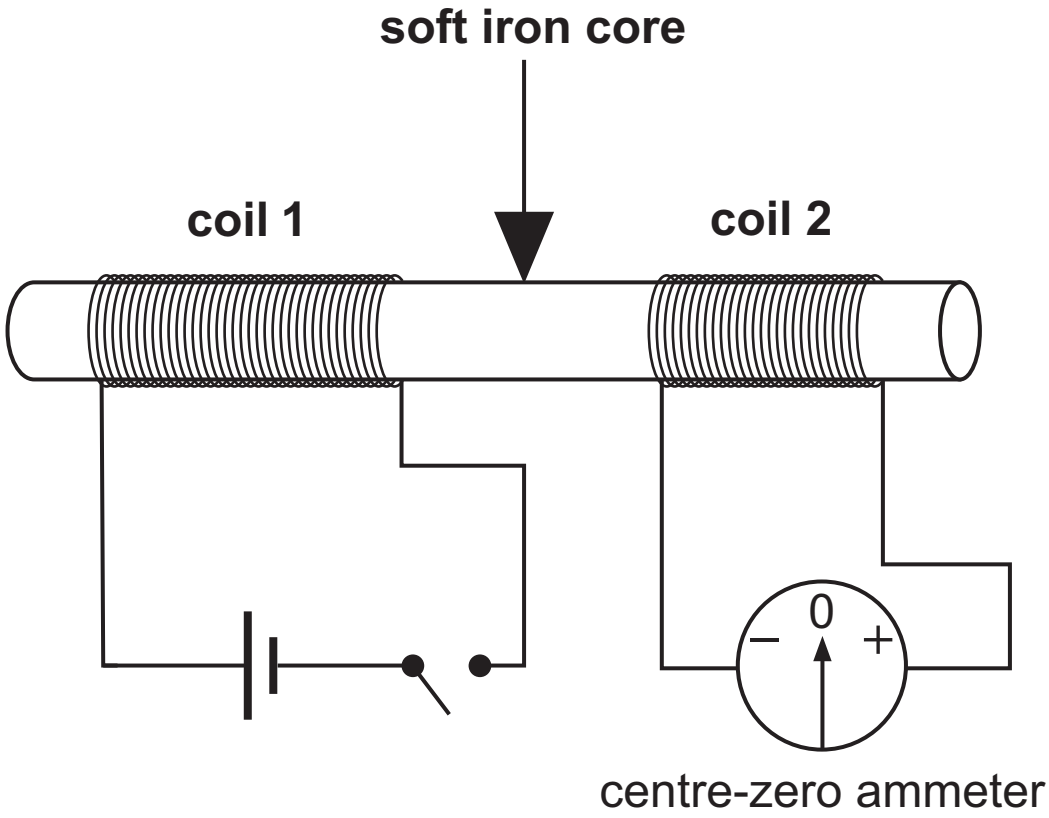


A **B** **C**

(iv) Which of the traces shows a.c.? [1 mark]

_____

(b) Two coils of wire are wrapped around a soft iron core.
One coil is connected to a cell and a switch.
The other coil is connected to a centre-zero ammeter.



Describe how this apparatus is used to investigate electromagnetic induction. [6 marks]

In your description you should state:

- what is meant by electromagnetic induction, in the context of this experiment
- the purpose of the soft iron core
- what is observed on the centre-zero ammeter when the switch is closed and left closed

- what is observed on the centre-zero ammeter when the switch is reopened

- what device used in the transmission of electricity is based on the apparatus shown above.

In this question, you will be assessed on your written communication skills including the use of specialist scientific terms.

Write your answers in the appropriate space on the page below.

What is electromagnetic induction?

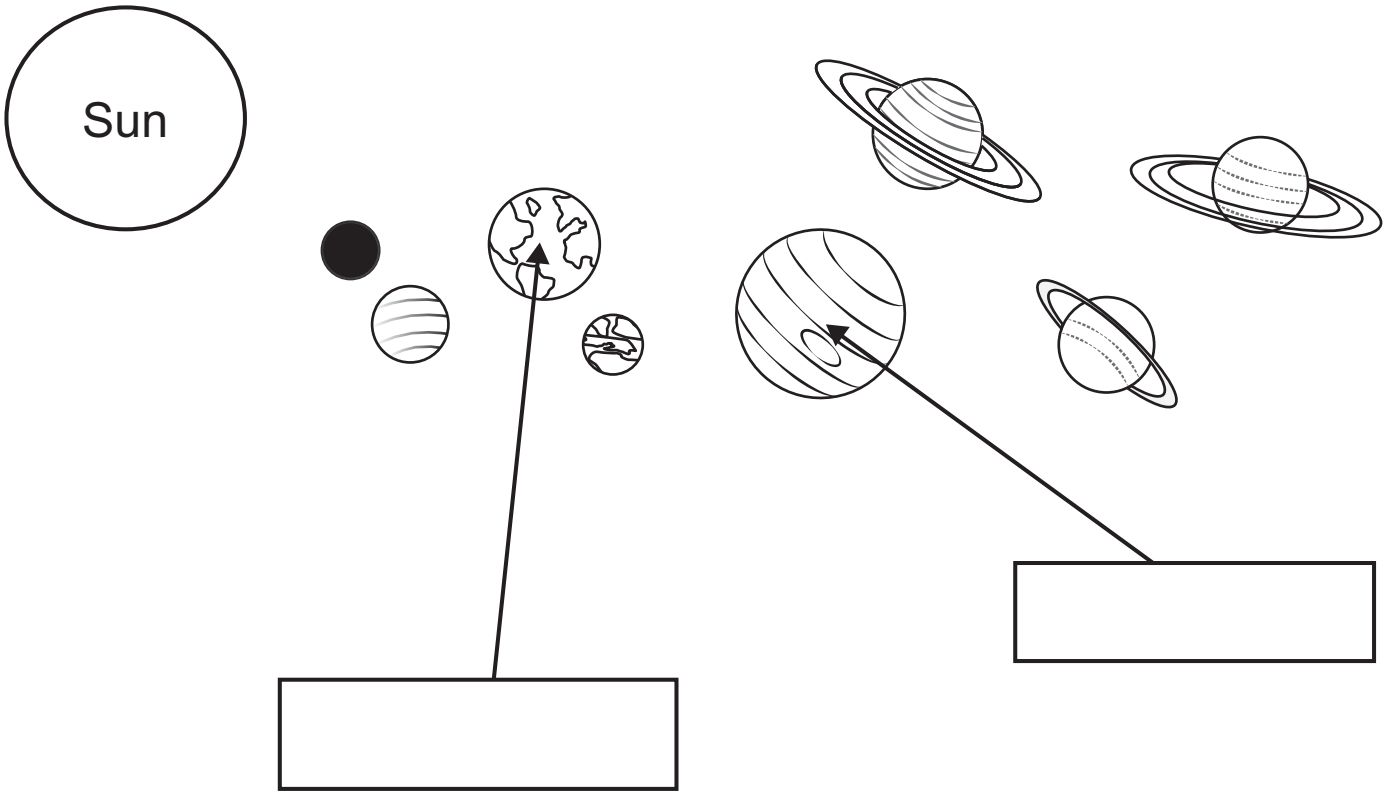
Purpose of the soft iron core

What is observed when the switch is closed and left closed?

What is observed when the switch is re-opened?

Device used in electricity transmission

5 **(a)** The diagram below shows the planets in our solar system.



Name the planets marked by arrows. Write their names in the boxes provided. [2 marks]

(b) **(i)** What does red shift mean? [1 mark]

_____

_____

(ii) What does this observed red shift tell us about the space between us and other galaxies? [1 mark]

_____

_____

(c) Complete the following sentences by selecting the most appropriate words below.

Big Bang
dust
universe
fusion
gravity
light
oxygen
planets
radiation
radiowaves
stars
Sun

(i) In our Solar System the _____ was formed when enough _____ and gas from space was pulled together by _____.

Smaller masses also formed and were attracted by larger masses to become _____ .

[4 marks]

(ii) According to recent measurements, about 14 billion years ago the _____ began as a result of the_____ . [2 marks]

This is the end of the question paper

SOURCES

Q1(d) . . Source: © *Chief Examiner*

Q4(a)(iv) . Source: © *http://www.schoolphysics.co.uk/age16-19/Electricity%20and%20magnetism/Electrostatics/text/Cathode_ray_oscilloscope/index.html*

Q4(b) . . Source: © *Principal Examiner*

Q5(a) . . Source: © *Chief Examiner*

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Question Number	**Marks**
1	
2	
3	
4	
5	
Total Marks	

Examiner Number